



Pressure Transmitter

Single Flange Transmitter

Differential Pressure Transmitter

Double Flange Transmitter

Level Transmitter

Online Density Meter

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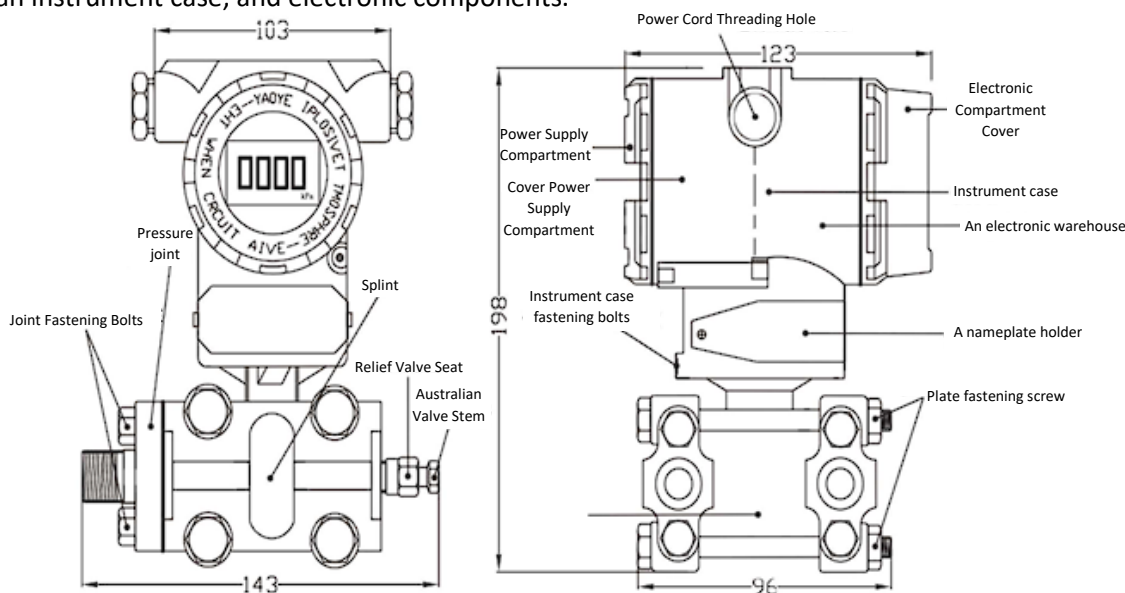
1. Transmitter Overview

Our fully isolated intelligent, single-crystalline silicon-type intelligent pressure/differential pressure transmitters are collectively referred to as intelligent transmitters. The fully isolated intelligent pressure/differential pressure transmitter is a fully isolated intelligent field measuring instrument with a HART communication protocol developed and designed by our company with reference to advanced foreign experience and the application of fully isolated circuit technology. The intelligent transmitter uses a fully isolated circuit technology design to isolate the power supply and sensor signals, thereby improving the stability and anti-interference ability of the whole machine. In particular, it has a strong anti-interference ability for strong interference signals of various frequencies generated by equipment such as frequency converters and motors at the worksite and is superior to similar domestic and foreign products in terms of anti-high-frequency interference signals.

The intelligent transmitter also has parameter data backup and recovery functions. When data is modified or damaged by mistake, it can be restored by restoring modified or damaged data online with one click. The intelligent transmitter is equipped with a coding potentiometer. You can adjust the zero pressure by rotating the coding potentiometer knob outside the instrument housing without opening the transmitter cover. It is convenient and flexible to use on-site, and the efficiency has greatly improved. The key functions of the intelligent transmitter can be realized by the communication software or the hand operator produced by our company.

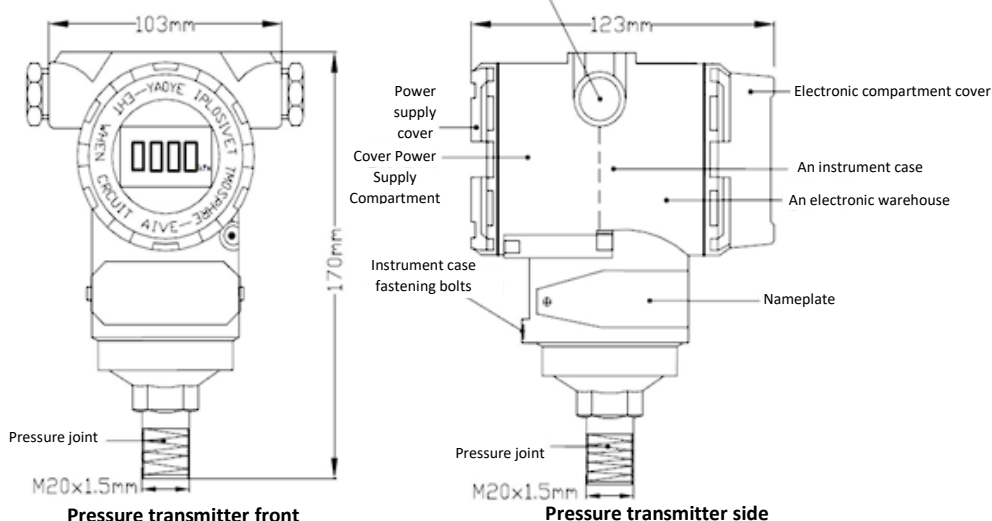
2. Transmitter appearance, structure and size

The transmitter is mainly composed of a pressure/differential pressure sensor (referred to as 8 chambers), a clamping plate, also known as a pressure chamber, a pressure connector, fastening bolts, a relief valve, an instrument case, and electronic components.



Front view of differential pressure transmitter

Differential pressure transmitter side



Pressure transmitter front

Pressure transmitter side

3. Transmitter Technical Specifications

3.1 Functional parameters

Application: liquids, gases and steam.

Measuring range: 0.1~60MPa

Signal output: Two-wire 4~20mA isolated DC signal superimposed HART digital signal output, linear or square root output can be selected, the maximum output current does not exceed 22mA.

Power supply: DC 12~45V; HART communication: 15.5~45VDC;

General working voltage: 24V DC.

Load range: When HART communication is used, the resistance in the power supply loop is ≥ 250 ohms and the power supply voltage is ≥ 15.5 volts, see Figure 3-3.

Communication distance: The diameter of the connecting wire is greater than 0.6mm, and the communication distance is about 1500 meters.

Display: Intelligent LCD 5.5-digit digital + backlight (white/green optional) Display

Combined use: The display on the LCD can realize the modification of the measuring range without pressure (passive migration), and can display kPa, mA, %, °C, mmH₂O, MPa, Pa, mbar, atm, psi, Torr engineering units in a cyclic or fixed manner, set fixed current output, modify damping time, linear, square root output and backup and restore data.

Zero and range migration: The lower limit of the measuring range is not lower than the lower limit of the maximum measuring range, and the upper limit is not higher than the upper limit of the maximum measuring range.

Pressure fine adjustment: refer to the button instructions.

Damping value: Electronic damping adjustable range 0~32 seconds.

Magnification: Adjustable within the range of 1~128 times according to needs.

Fault alarm: When the self-diagnosis program detects a fault, the analog output is higher than 20.8mA or lower than 3.9mA.

Recover data: When data is damaged, it can be restored on-site with three buttons.

Temperature indication: Indicates the on-site ambient temperature value where the transmitter is working.

Work temperature: -40~85°C, with LCD display: -35~85°C.

Storage temperature: -45~90°C.

Safety protection: AND circuit protection design, anti-static shock, surge current, and powerful overload protection.

3.2 Technical parameters

Basic error: $\pm 0.075\%$, 0.1%, 0.2%.

Repeatability error: 0.1%, 0.2%, 0.3%

End base consistency error: $\pm 0.1\%$, 0.2%, 0.3%.

Hysteresis: 0.1%, 0.2%, 0.3%

Stability: Within the measuring range, the basic error will not exceed within one year.

Interference characteristics: Add 1~100kHz, peak 1~380VAC variable frequency interference signal to the power supply and housing, 4~20mA output variation is $\leq \pm 0.2\%$.

Temperature influence: For DP and GP types, the range code is 4~8, the error is $\leq \pm 0.15\%/10^\circ\text{C}$, the maximum range limit; for other types and other ranges, the error is doubled.

Constant current performance: Variation $< 0.075\%$.

Insulation performance: power supply to ground resistance $> 400\text{M}\Omega$.

Response time: When powered on, the response time is < 2 seconds.

Sensitivity: lower limit and range change $< 0.01\%$.

Power supply voltage change: lower limit and range change $< 0.02\%$.

Steady state change: Short-term power interruption, change $\leq 0.02\%$.

Over range: lower limit value and range change $< 0.05\%$.

Static pressure error: DP type, for 14MPa, the lower limit value change is $< \pm 0.3\%$;

HP class: for 32MPa, the lower limit value change is $\leq \pm 0.5\%$.

External magnetic field influence: in 400A/m (root mean square magnetic field, the change is $< 0.05\%$.

Mechanical vibration: Vibration frequency: 50Hz, full amplitude: 0.2mm, vibration for 2 hours, residual lower limit value and range change amount $< 0.075\%$.

Installation position influence: When the sensor center measuring diaphragm is not vertical, a zero-position system error of no more than 0.24kPa may be generated, but this error can be eliminated by adjusting the zero-pressure fine-tuning and has no effect on the range.

Structural materials: For materials of parts in contact with the medium, such as pressure chamber, joint, relief valve, isolation diaphragm, etc., please refer to the "MH Series Isolation Intelligent Pressure/Differential Pressure Transmitter Selection Sample" for details.

Pressure connection: The connection hole on the pressure chamber is 1/4-18NPT, and the connection hole on the pressure connector is 1/2-14NPT, the distance can be changed by adjusting the connector.

Electrical connection: The transmitter housing has two M20×1.5 screw holes for connecting the cable conduit. The test pad, if connected to the communicator, can be fixed on the test pad.

Volumetric suction: $< 0.16\text{cm}^2$

4. Transmitter installation and measurement at work site

4.1 Electrical installation

As shown in the figure below: The power supply is connected to the transmitter through the signal line. The power supply and signal share a pair of wires, and no external wiring is required. The power supply wiring terminals are divided into positive and negative terminals and are set in the power supply compartment of the instrument housing. When wiring, unscrew the power supply compartment cover and connect the power supply signal line to the positive and negative wiring terminals according to the positive and negative poles (see Figures 2-1 and 2-2).

The power signal line can be twisted pair. In sites with serious electromagnetic interference, it is recommended to use a shielded line and ground it well. The cross-sectional area of the power signal line should be $0.5 \leq S \leq 2.5 \text{ mm}^2$. It should not be put in the same metal pipe or placed in the same wire through with other power lines, and it should not pass near strong current equipment.

The threading hole on the instrument case should be sealed with a sealing plug (bolt M20×1.5) to prevent moisture accumulation in the power supply compartment of the instrument case. If the threading hole for the power cord is not sealed, the threading hole should be facing downward to drain the liquid.

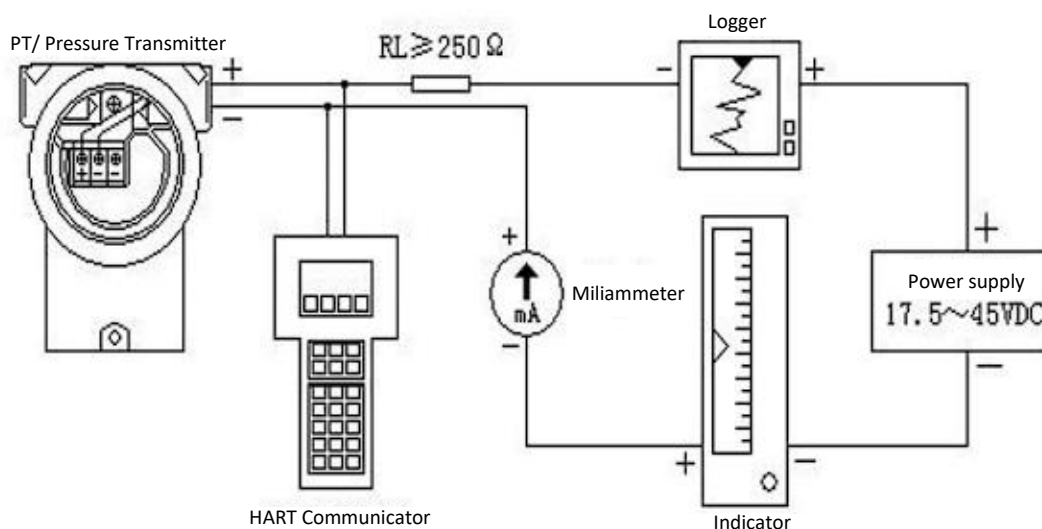
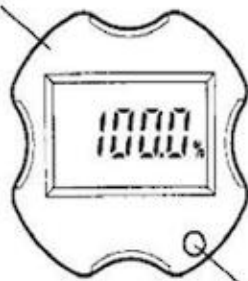


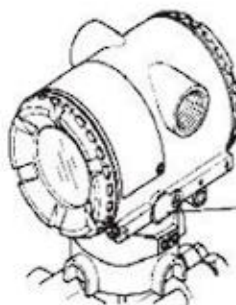
Figure 5-1 Transmission on-site wiring

Built-in Indicator



Range setting switch (button)

Note: When pressing the measurement range setting knob, use a thin rod with a straight end, such as a hexagonal wrench



Zero adjustment screw

Zero point adjustment



After completing the operation preparation, make adjustments and write points out

After adjustment, the power cannot be cut off immediately. If the rated power and zero point are restored within 30 seconds after adjustment, the original value will be restored.

■ Transmitter external zero adjustment screw

Before adjusting the transmitter's external zero adjustment screw, confirm the following points.

* Use a flat-blade screwdriver to adjust the zero adjustment screw. Clockwise adjustment increases the output, while counterclockwise adjustment decreases the output. The accuracy of a zero adjustment can reach 0.01% of the range. The change in the zero adjustment point is determined by the adjustment speed. Therefore, fine adjustments should be made slowly, while coarse adjustments can be made faster.

5. Mechanical installation and measurement of transmitter

5.1 Installation type and precautions

The transmitter can be installed at the measuring point, on the wall, or clamped on using a mounting bracket (transmitter accessory). 2" (about 50~60mm in diameter) pipe. The installation types of the transmitter are mainly: bent bracket pipe mounting, bent bracket plate mounting and flat bracket pipe mounting. There are four types: mounted and flat bracket plate mounted. As shown in Figures 5-2a, 5-2b, 5-2c, and 5-2d (for user selection).

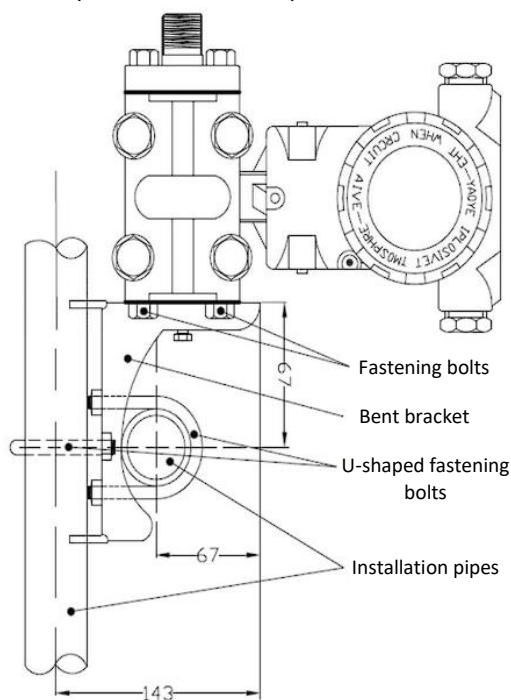


Figure 5-2a Bent bracket pipe installation

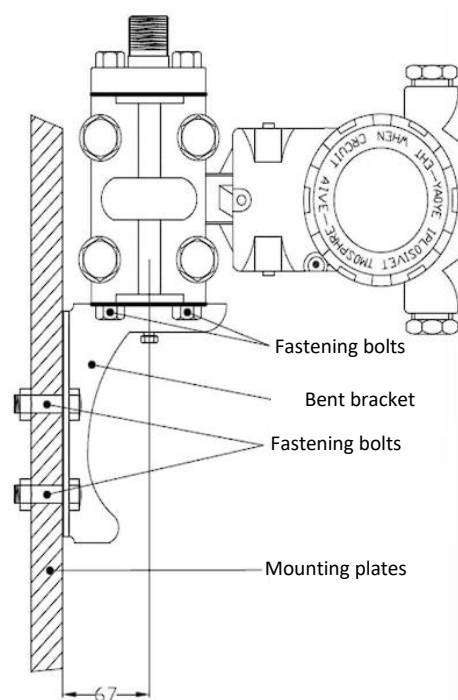


Figure 5-2b Bent bracket board installation

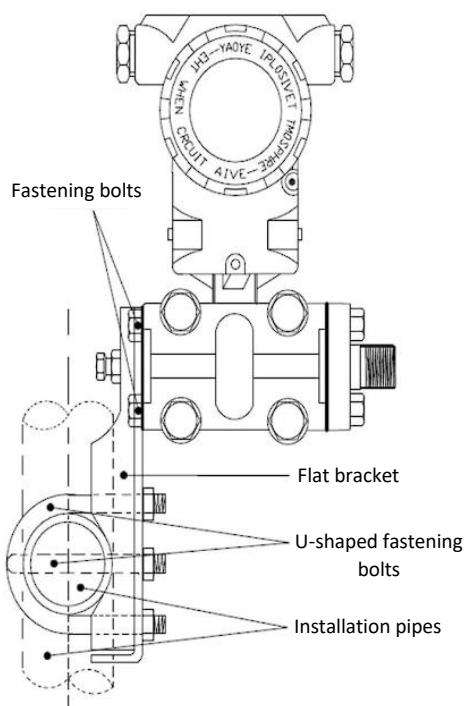


Figure 5-2c Flat bracket tube installation

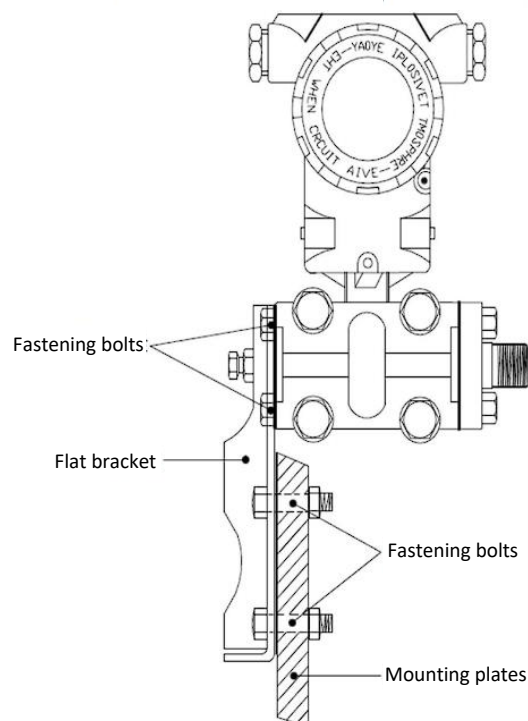


Figure 5-2d Flat bracket installation

The pressure port on the transmitter housing is connected with NPT1/4 threaded holes, while the pressure port on the transmitter head is connected with NPT1/2 threaded holes or flat pipe threads.

To ensure the sealing of the pressure port, the screw plug should be tightened with a torque wrench during installation, with a maximum tightening torque of 40N·m. Do not repeatedly install or remove the screw plug. For easy installation, when rotating the transmitter body, the housing of the pressure chamber should remain fixed to avoid the production of additional torque. If the transmitter is installed horizontally (e.g., in vertical pipe installations with liquid level measurement), attention must be given to the orientation of the pressure port to avoid the influence of liquid column pressure on measurement accuracy. This can be adjusted through the transmitter's buttons, rotary code switches, or HART communication interface to recalibrate the zero position, known as the "zero-point trim."

To determine the correct installation position of the transmitter and pressure tube, it is necessary to avoid placing the transmitter in extreme conditions where the working environment is harsh, such as in locations with high vibration or where there is a risk of temperature fluctuations.

For optimal installation of the transmitter and pressure tubes, the following working conditions should be considered:

1. Prevent direct exposure to the transmitter's corrosion-resistant material.
2. Avoid clogging of the pressure pipe.
3. Reduce the risk of pressure loss.
4. Ensure the liquid column in the pressure pipe is balanced.
5. Reduce the impact of temperature gradients on the pressure pipe and prevent excessive temperature fluctuations.

For the installation of transmitters with remote flanges, the relationship between the transmitter and the remote flange should be considered to ensure optimal installation. Specific measures include:

1. The finer the capillary tube, the better.
2. When installing a transmitter with a remote flange to measure the liquid level in a container, the transmitter and the flange should be kept at the same height or slightly lower than the reference flange (see Figure 5-3). When using two remote flanges with a transmitter installed at different heights (see Figure 5-4), the transmitter should be installed at the midpoint between the two flanges or at the midpoint of the pressure measurement ports.

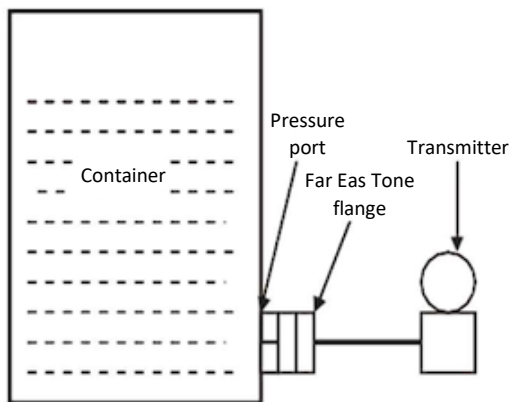


Figure 5-3 Transmitter installation with single flange

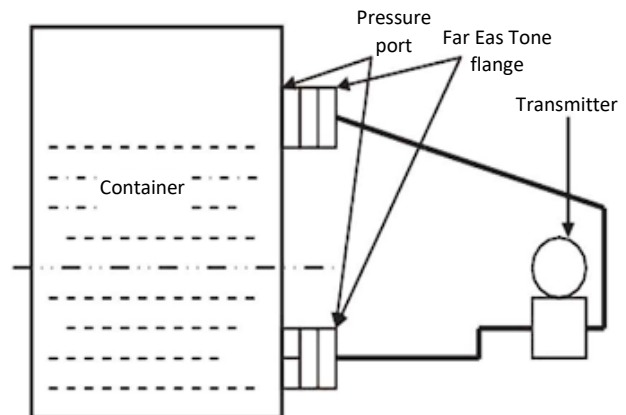


Figure 5-3 Transmitter installation with double flange

3. The remote transmission flange and capillary installed on site should be kept away from direct sunlight;
4. For transmitters with two remote flanges, the capillary lengths of the two should be as similar as possible.

5.2 Causes and solutions of errors

The pressure pipe connects the transmitter and the process pipeline and transmits the pressure at the pressure tapping port on the process pipeline to the transmitter. In the process of pressure transmission, the following reasons may cause errors:

1. Leakage:
2. Wear loss (especially when using cleaning agents)
3. There is gas in the liquid pipeline, causing pressure error:
4. Liquid accumulates in the gas pipeline, causing pressure error:
5. The density difference between the two pressure pipes caused by the temperature difference causes pressure error:

Ways to reduce errors are as follows:

1. The pressure pipe should be as short as possible:
2. When measuring liquid or steam, the pressure pipe should be connected to the process pipe as far upward as possible, and its slope should not be less than 1/12:
3. When measuring gas, the pressure pipe should be connected to the process pipe as downward as possible, and its slope should not be less than 1/12:
4. The layout of the liquid pressure pipe should avoid the presence of a high point in the middle, and the layout of the gas pressure pipe should avoid the presence of a low point in the middle:
5. The two pressure pipes should maintain the same temperature:
6. To avoid the influence of friction, the diameter of the pressure pipe should be large enough;
7. There should be no gas in the pressure pipe filled with liquid:
8. When using isolation fluid, the liquid in the pressure pipes on both sides must be the same:
9. When using a cleaning agent, the connection of the cleaning agent pipe should be close to the pressure tapping port of the process pipeline. The length and diameter of the pipeline through which the cleaning agent passes should be the same, and the cleaning agent should be prevented from passing through the transmitter.

5.3 Measuring liquid

As shown in Figure 5-5: When measuring liquid, the pressure port should be opened on the side of the process pipeline to avoid slag deposition. At the same time, the transmitter should be installed next to or below the pressure port to allow bubbles to be discharged into the process pipeline. For transmitters with a relief valve in the pressure chamber, the relief port of the relief valve should be placed upward to discharge the gas in the measured medium.

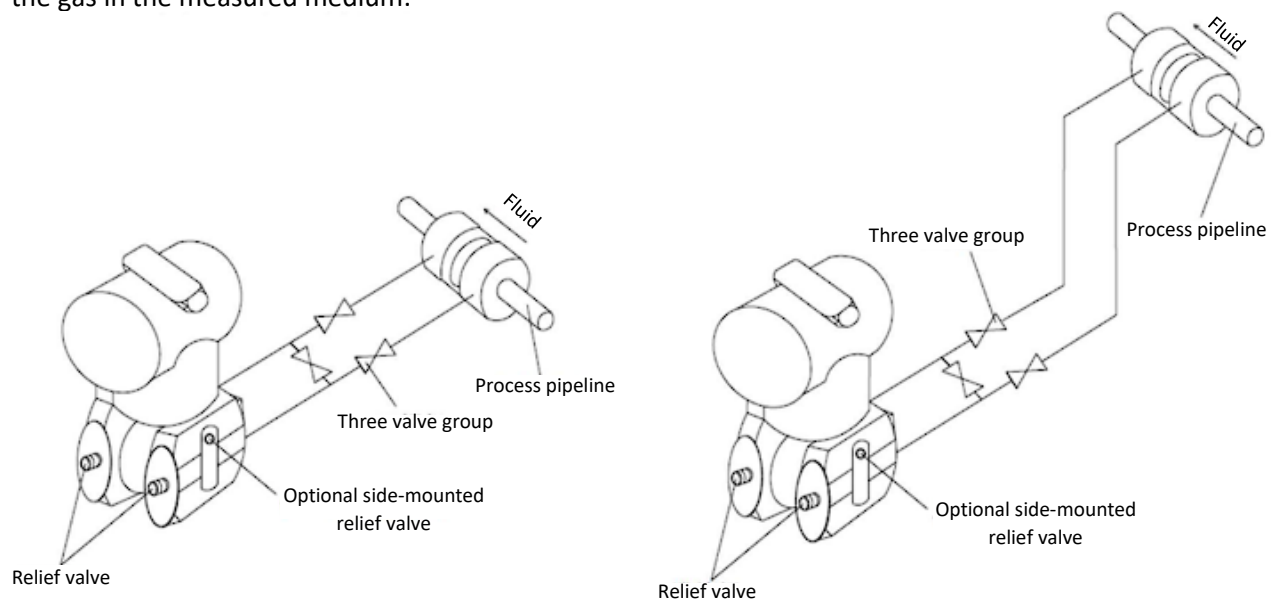


Figure 5-5 Measuring liquids

5.4 Measuring gas

As shown in Figure 5-6: When measuring gas, the pressure tapping port should be opened on the side or top of the process pipeline, and the transmitter should be installed beside or above the process pipeline so that the accumulated liquid can easily flow into the process pipeline. For transmitters with a relief valve installed in the pressure chamber, the relief port of the relief valve should be placed downward to discharge the accumulated liquid in the measured medium.

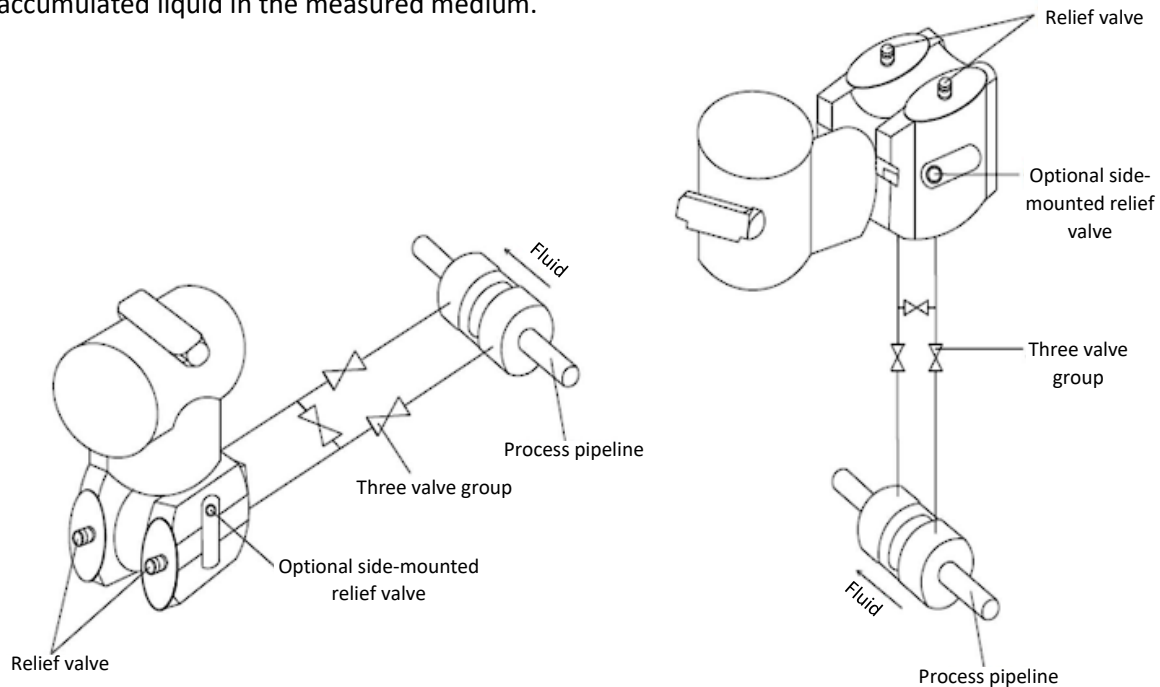


Figure 5-6 Measuring gas

5.5 Measuring steam

As shown in Figure 5-7: When measuring steam, the pressure tapping port should be opened on the side of the process pipeline, and the transmitter should be installed below the pressure tapping port so that the condensate can fill the pressure pipe.

When measuring steam, the pressure pipe should be filled with water to prevent the steam from directly contacting the transmitter. The volume change is very small, so there is no need to install a condenser.

Note that when measuring steam or other high-temperature media, the temperature to which the transmitter is subjected should not exceed its maximum operating temperature

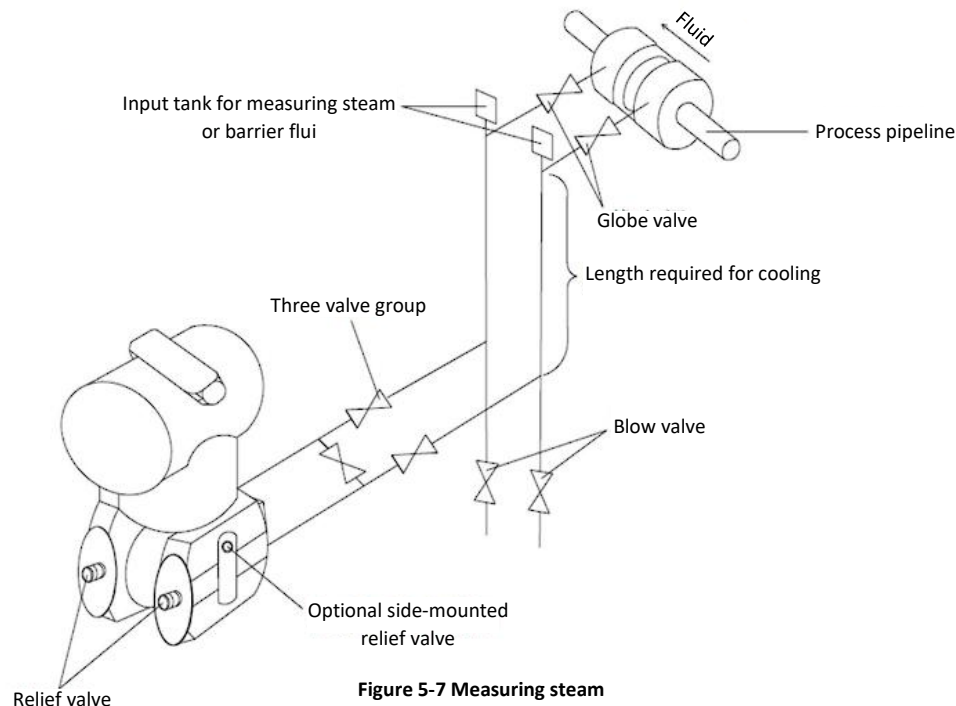


Figure 5-7 Measuring steam

5.6 Measuring liquid level

Use a transmitter with a remote transmission flange to measure the liquid level. For measuring the liquid level of a general viscous medium, use a flat flange. For a medium with high viscosity and easy precipitation and suspension, use an insertion flange for measurement. When installing, the measuring diaphragm must penetrate deep into the inner wall of the container, at least tangent to the inner wall of the container.

(1) Measuring the liquid level in an open container

The pressure tapping port at the lower end of the container is connected to the high pressure side of the transmitter via a flange, while the low pressure side of the transmitter is connected to the atmosphere. There are three possible installation and connection methods for the transmitter at the pressure tapping port of the container. The method for determining the measuring range of the transmitter is as follows:

1. The transmitter is installed at the same level as the pressure port. When the lower limit liquid level is level with the pressure port (see Figure 5-8), the measuring range value of the transmitter is determined as follows:

- x** is the vertical distance between the upper limit liquid level and the lower limit liquid level to be measured;
- r** is the specific gravity of the liquid being measured;
- g** is the acceleration due to gravity;
- P_x** is the pressure generated by the liquid column **x**.

The measurement range is from 0 to P_x , since: $P_x = x \cdot r \cdot g$

So: the measuring range of the transmitter = $0 \sim x \cdot r \cdot g$

For example: Given $x = 6500\text{mm}$, $r = 1\text{g/cm}^3$, $g (1\text{mm H}_2\text{O} = 9.81\text{Pa})$

So: $P_x = x \cdot r \cdot g = 6500 \times 1 \times 9.81 = 63.77\text{ kPa}$

Therefore: The measuring range of the transmitter is: $(0 \sim 63.77\text{kPa})$

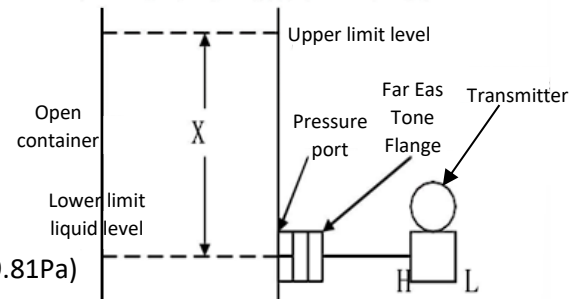


Figure 5-8 The transmitter is level with the pressure port

2. When the transmitter is higher than the pressure port and the lower limit liquid level is level with the pressure port (see Figure 5-9), the measurement range value is determined as follows:

- x** is the vertical distance between the upper limit liquid level and the lower limit liquid level to be measured;
- h** is the vertical distance between the pressure tapping port and the high pressure side of the transmitter;
- r** is the specific gravity of the liquid being measured;
- r₀** specific gravity of the filling fluid in the remote transmission flange;
- g** is the acceleration due to gravity;
- P_x** is the pressure generated by the measured liquid column **x**;
- P_h** is the negative pressure exerted by the filling liquid column **h** on the transmitter.

Measuring range from P_h to $P_x + P_h$

Because: $P_h = -h \cdot r_0 \cdot g$, $P_x = x \cdot r \cdot g$

So: the measuring range of the transmitter = $-h \cdot r_0 \cdot g \sim g (x \cdot r - h \cdot r_0)$

For example: given $x = 6500\text{mm}$, $h = 500\text{mm}$, $r = 1\text{g/cm}^3$, $r_0 = 1.9\text{g/cm}^3$, $g (1\text{mm H}_2\text{O} = 9.81\text{Pa})$

Obtain: $P_x = x \cdot r \cdot g = 6500 \times 1 \times 9.81 = 63.77\text{ kPa}$

$P_h = -h \cdot r_0 \cdot g = -500 \times 1.9 \times 9.81 = -9.32\text{ kPa}$

Therefore: The measuring range of the transmitter is: $(-9.32\text{ kPa} \sim 54.45\text{ kPa})$

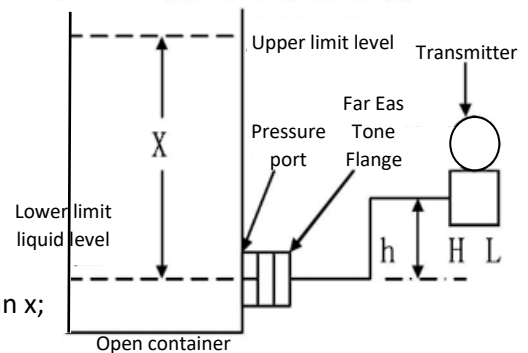


Figure 5-9 The transmitter is higher than the pressure port

3. When the transmitter is lower than the pressure port and the lower limit liquid level is level with the pressure port (see Figure 5-10), the measurement range value is determined as follows

x is the vertical distance between the upper limit liquid level and the lower limit liquid level to be measured;
h is the vertical distance between the pressure tapping port and the high-pressure side of the transmitter;
r is the specific gravity of the liquid being measured;
r₀ specific gravity of the filling fluid in the remote transmission flange;
g is the acceleration due to gravity;
P_x is the pressure generated by the measured liquid column **x**;
P_h is the negative pressure exerted by the filling liquid column **h** on the transmitter.

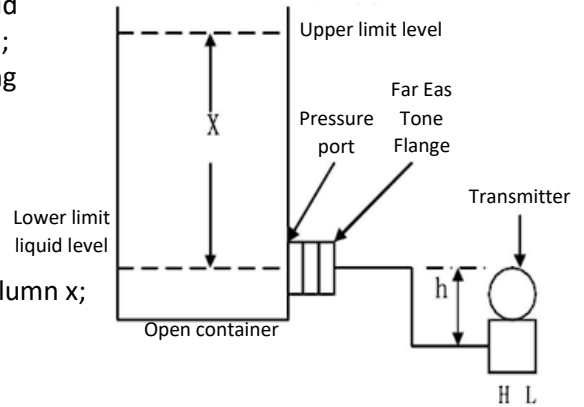


Figure 5-10 The transmitter is lower than the pressure port

Measuring range from P_h to $P_x + P_h$

Because: $P_h = -h \cdot r_0 \cdot g$, $P_x = x \cdot r \cdot g$

So: the measuring range of the transmitter = $-h \cdot r_0 \cdot g \sim g(x \cdot r - h \cdot r_0)$

For example: given $x = 6500\text{mm}$, $h = 500\text{mm}$, $r = 1\text{g/cm}^3$, $r_0 = 1.9\text{g/cm}^3$, g ($1\text{mm H}_2\text{O} = 9.81\text{Pa}$)

Obtain: $P_x = x \cdot r \cdot g = 6500 \times 1 \times 9.81 = 63.77\text{ kPa}$

$P_h = -h \cdot r_0 \cdot g = -500 \times 1.9 \times 9.81 = -9.32\text{ kPa}$

Therefore: The measuring range of the transmitter is: $(-9.32\text{ kPa} \sim 73.09\text{ kPa})$

4. The sanitary clamp pressure transmitter is a special product designed for the food and pharmaceutical fields. The standard 50.5MM flat membrane pressure interface can be quickly connected through the clamp and sanitary pipe. The sanitary clamp pressure transmitter is widely used in the food, pharmaceutical, brewing, fermentation and other industries. It is mainly divided into: conventional type, high temperature heat dissipation type, digital display type. The core part of the sanitary clamp pressure transmitter uses a high-precision, high-stability diffused silicon pressure chip from a well-known company. It fully complies with the sanitary standards of the pharmaceutical and food industries. Through a high-reliability amplifier circuit, the pressure of the measured medium is converted into a 4~20mA DC standard signal. The high-quality pressure sensor, exquisite packaging technology and perfect assembly process of the sanitary clamp pressure transmitter ensure the high quality and excellent performance of the product.

5.7 Measuring the liquid level in a closed container

The pressure in the sealed container above the liquid surface affects the pressure measured at the bottom. Therefore, the pressure at the bottom of the sealed container is equal to the pressure generated by the liquid plus the pressure of the sealed container above the liquid surface. In order to obtain the accurate value of the liquid level, the pressure of the sealed container above the liquid surface should be subtracted from the measured pressure at the bottom of the container. Therefore, a pressure tapping port must be opened at the top of the sealed container to offset the low-pressure side of the transmitter. The differential pressure obtained is proportional to the liquid level.

1. Dry pressure connection method, as shown in Figure 5-11:

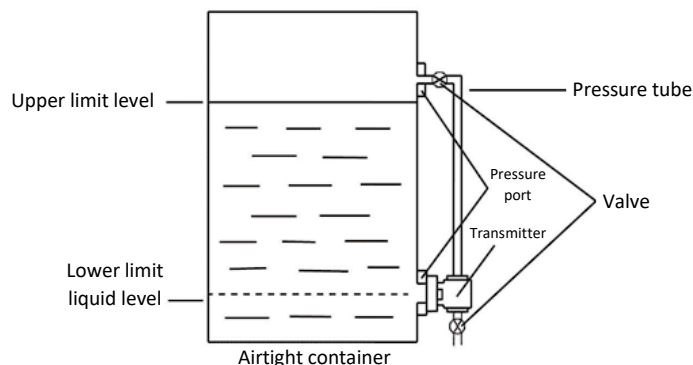


Figure 5-11 Dry pressure connection method

If the gas on the liquid surface in the sealed container does not condense and the pressure pipe connected to the low-pressure side of the transmitter is always kept dry, in this case, the installation connection of the transmitter is called the dry pressure connection method.

When using the dry pressure connection method, the method for determining the measurement range value is the same as the method for **"measuring the liquid level of an open container"**.

2. Double flange connection method

If the gas on the liquid surface in the sealed container will condense, when the dry pressure connection method is used, the pressure pipe connected to the low-pressure side of the transmitter will gradually accumulate liquid, causing measurement errors. To eliminate this error, remote transmission flanges should be installed at the top and bottom pressure ports of the sealed container, respectively, which is called the double flange connection method, as shown in Figure 5-12;

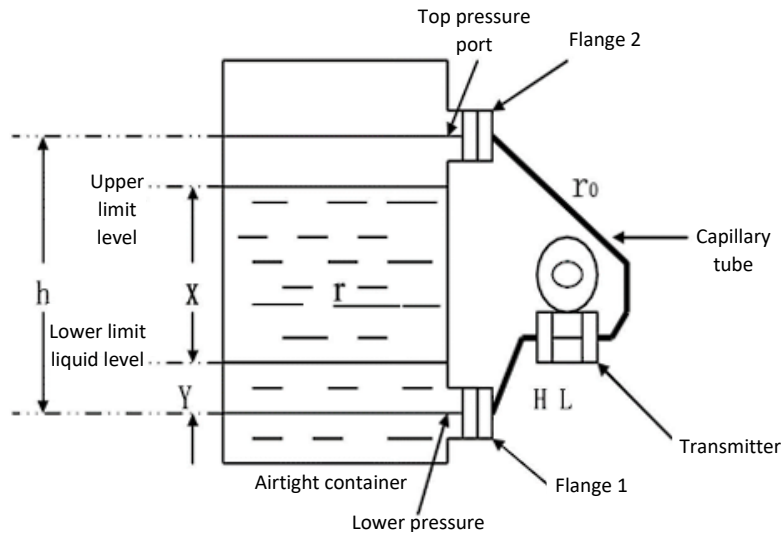


Figure 5-11 Double flange connection method

When using the double flange connection method for installation, the low pressure (L) side should be connected to the top pressure port, the high pressure (H) side should be connected to the bottom pressure port, and the transmitter should be installed in the middle. In this way, the transmitter will generate a negative differential pressure due to the height of the filling liquid in the capillary tube. Its size is determined by the height difference between the upper and lower pressure ports of the sealed container and the specific gravity of the filling liquid in the capillary tube, and has nothing to do with the installation position of the transmitter. If this negative differential pressure is small, it can be eliminated by adjusting the zero pressure fine-tuning method; if the negative differential pressure is large, it should be calculated when determining the measurement range value. The method is as follows:

X is the vertical distance between the upper limit level and the lower limit level of the measured liquid;

Y is the vertical distance from the lower limit liquid level to the lower pressure port;

h is the height difference between the upper and lower pressure ports;

r is the specific gravity of the liquid being measured;

r₀ is the specific gravity of the filling liquid in the remote transmission flange;

g is the acceleration of gravity; the above are known quantities,

P_x is the pressure generated by the measured liquid column x;

P_y is the pressure generated by the measured liquid column Y;

P_h is the filling fluid in the capillary

Pressure: The measuring range is from P_y-

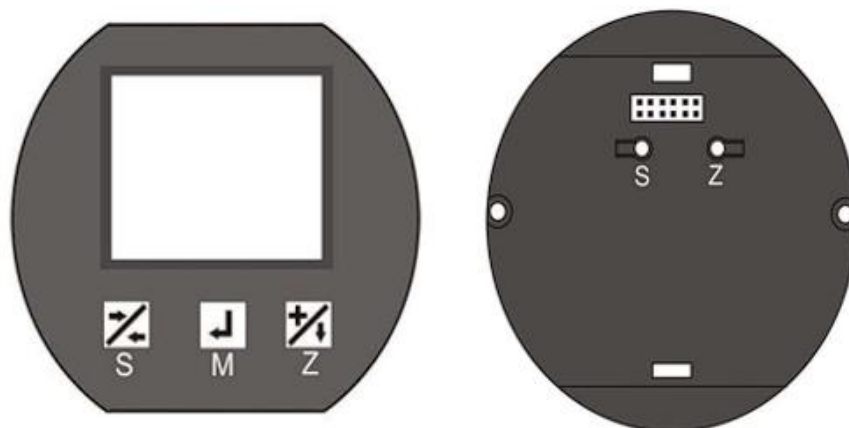
P_h to P_x + P_y - P_h

Since: P_x = x · r · g, P_y = y · r · g, P_h = h · r₀ · g,

the measuring range of the transmitter is (P_y - P_h) ~ (P_x + P_y - P_h) = g(y · r - h · r₀) ~ g((x + y)r - h · r₀)

6. Transmitter display key configuration key operation instructions

6.1 Panel diagram of the first type display module



2. Transmitter key operation without LCD display module

When the transmitter does not have LCD display module, the following operations can be performed using the buttons S and Z on the circuit board (as shown in Figure 1).

2.1 Clear

Make sure the transmitter is powered on and in a zero-pressure state, press and hold the S and Z buttons for more than 5 seconds, then release the two buttons at the same time, and press and hold the two buttons again for about 3 seconds. The transmitter will be reset to zero according to the current pressure value.

2.2 Lower limit calibration (zero-point active migration)

Make sure the transmitter is powered on and under pressure at the lower limit of the range. Press and hold the S and Z buttons for more than 5 seconds, then release both buttons at the same time. Press and hold the Z button for about 3 seconds again. The transmitter will use the current pressure as the lower limit of the range, but the range of the transmitter will not change. For example: the range of the transmitter is 0-5kPa, and the current pressure is -1kPa. After executing this operation, the range of the transmitter becomes -1 - 4kPa.

2.3 Upper limit calibration (full point calibration)

Make sure the transmitter is powered on and under pressure at the upper limit of the range. Press and hold the S button and the Z button for more than 5 seconds, then release the two buttons at the same time. Press and hold the S button again for about 3 seconds. The transmitter will use the current pressure as the upper limit of the range, but the lower limit of the range will not change. For example: the range of the transmitter is 0 - 5kPa, and the current pressure is 4kPa. After executing this operation, the range of the transmitter becomes 0 - 4kPa.

3. LCD display module transmitter button operation

When the transmitter is equipped with a liquid crystal display module, the transmitter can not only realize the operations described in item 2, but also use the three buttons of the liquid crystal display module to configure the parameters of the transmitter. Please refer to Figure 2 for the buttons.

Note: If the transmitter parameters cannot be modified, please change the menu item "Write Protection" to "Off" (refer to the menu structure for specific operations).

3.1 Button Description

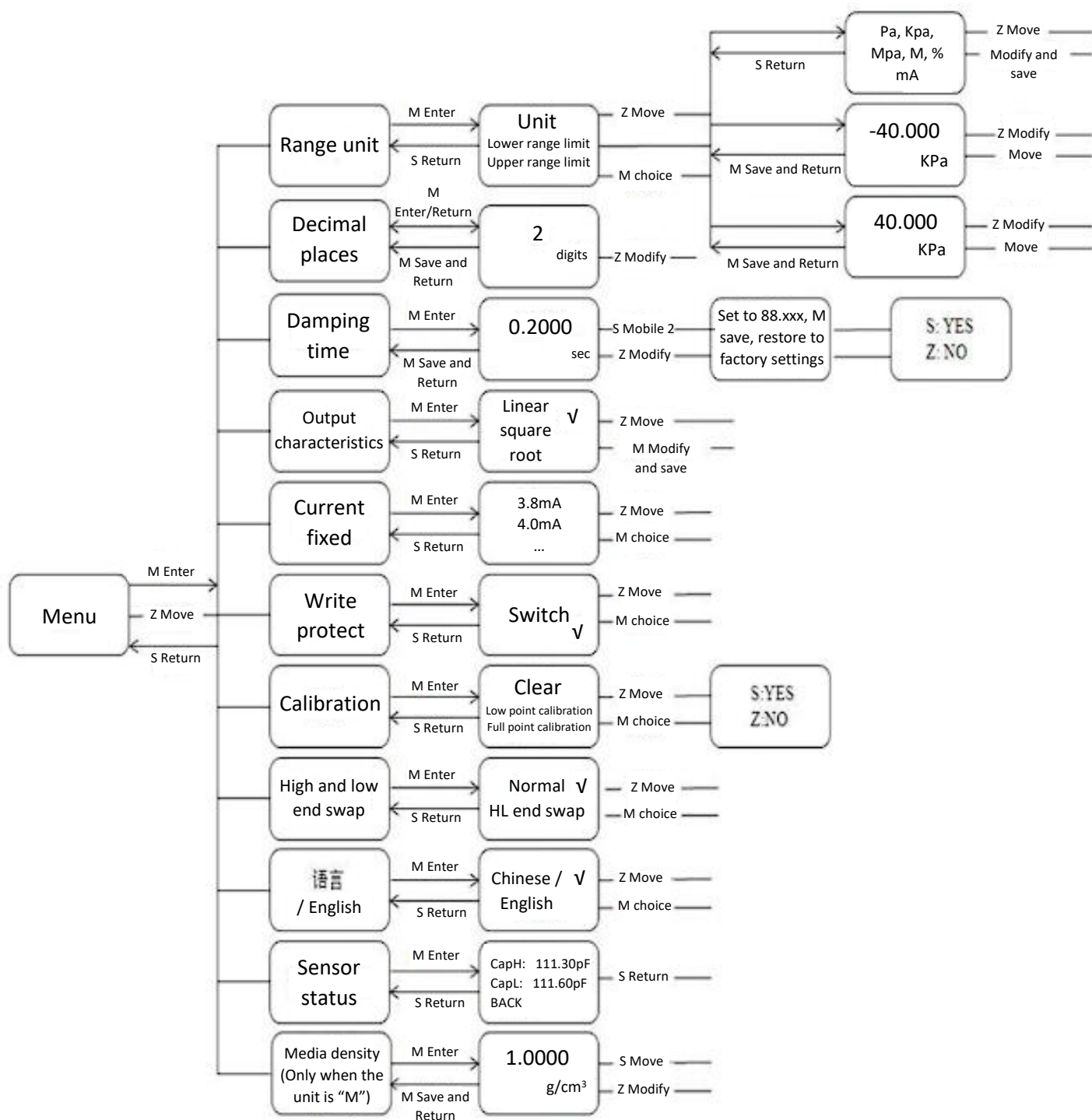
Button Icon	Button Name	Button function
	S	In the menu state, it has the return function; in the parameter setting state, it has the shift function. This button also has the second S button function.
	M	Menu and parameter confirmation buttons.
	Z	In the menu state, it is the selection function; in the parameter setting state, it is the +1 function. This button also has the second 2-button function.

3.2 Configuration Operation

When configuring the transmitter, make sure the transmitter is powered on and in the measurement display state. Press and hold the M button for about 5 seconds to display the main menu interface, then release the button to enter the configuration menu interface. Press the S button to return to the main measurement interface, press the Z button to select a menu item, and the M button is the confirmation button.

After entering the specific parameter setting interface, press the S key to cycle through the digits to be modified, including numbers, decimal points and negative signs. Press the 2 keys to modify the selected digits, the digits are +1, the decimal points are cycled, and the negative signs are positive and negative. Press the left key to save the modification and return to the previous menu.

For specific operations, refer to the following structure diagram:



3.3 Configuration Operation

When configuring the transmitter, make sure the transmitter is powered on and in the measurement display state. Press and hold the M button for about 5 seconds to display the main menu interface, then release the button to enter the configuration menu interface. Press the S button to return to the main menu, press the Z button to select a menu item, and the M button is the confirmation button.

After entering the specific parameter setting interface, press the S key to cycle through the digits to be modified, including numbers, decimal points and negative signs. Press the Z key to modify the selected digits, the digits are +1, the decimal points are cycled, and the negative signs are positive and negative selections. Press the M key to save the changes and return to the previous menu.

An example is as follows: (For other operations, see the menu structure.)

- **Modify the unit** (JT3051 has 11 units, namely KPa, m4H2O, M, inH2O, mmH2O, PSI, bar, mbar, Pa, %)

On the main menu page,

- Press the **Z** key to move the selection up and down, select "Range Unit", and short press M to enter;
- Press the **Z** key to move the selection up and down, select "Unit", and short press M to enter;
- Press the Z key to select the unit, and short press the M key to confirm the selection. At this time, the right side will appear to indicate that the operation is successful. Otherwise, please check whether the "write protection" is "off";
- Press S to return to the previous interface.

- **Modify upper limit**

On the main menu page,

- Press the Z key to move the selection up and down, select "Range Unit", and short press M to enter;
- Press the Z key to move the selection up and down, select "Upper Limit", and short press M to enter;
- Press the S key to select the modified digit, and short press the 2 key to modify the number. If the key does not respond, please check whether the "write protection" is "off";
- Press M to save and return to the previous interface.

- **Modify upper limit**

On the main menu page,

- Press the **Z** key to move the selection up and down, select "Range Unit", and short press M to enter;
- Press the **Z** key to move the selection up and down, select "Lower Limit", and short press M to enter;
- Press the S key to select the modified digit, and short press the Z key to modify the number. If the key does not respond, please check whether the "write protection" is "off";
- Press M to save and return to the previous interface.

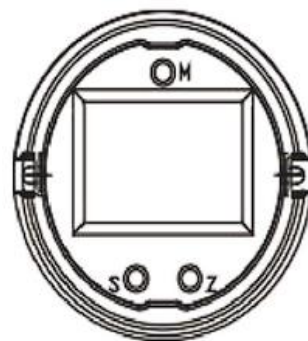
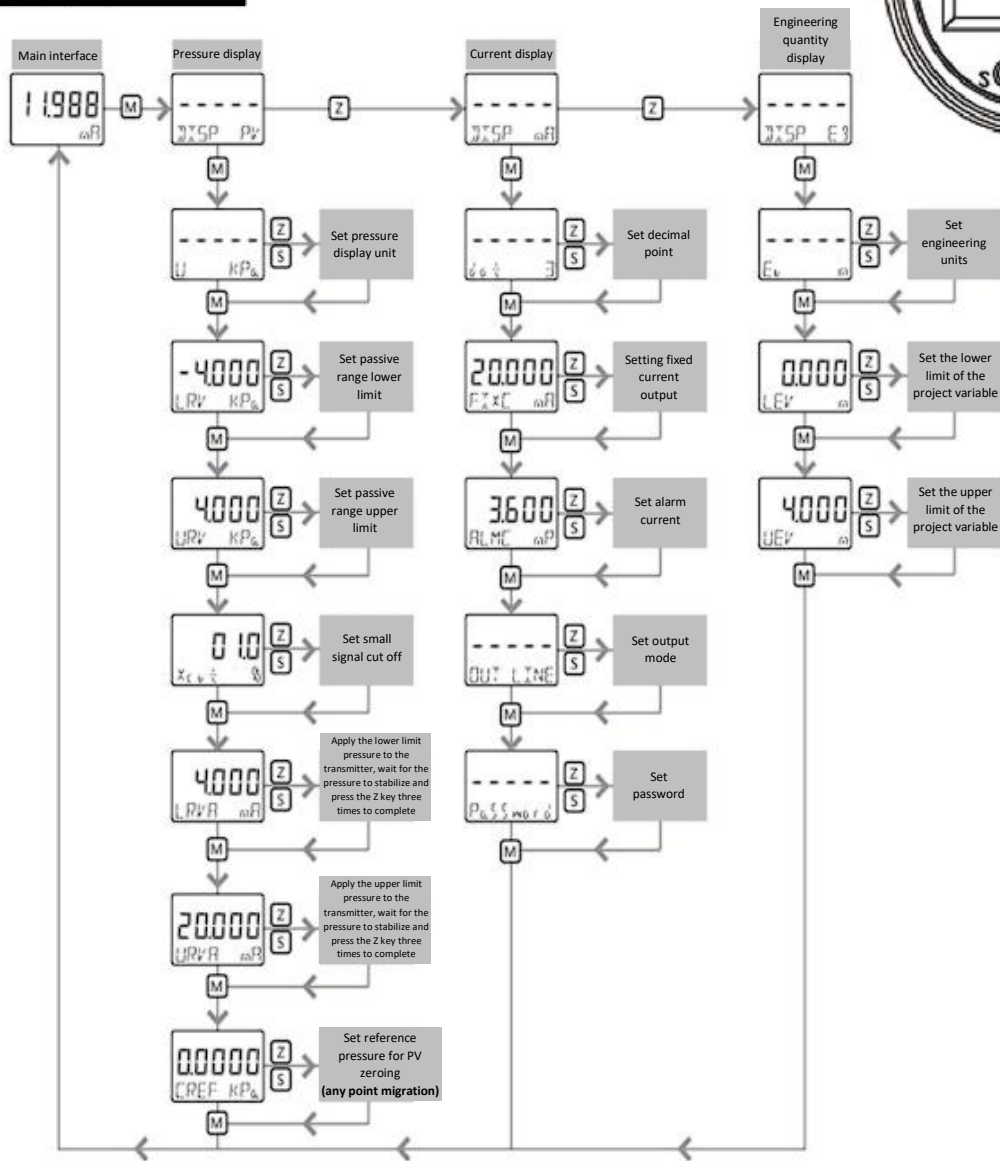
- **Restore factory settings**

On the main menu page,

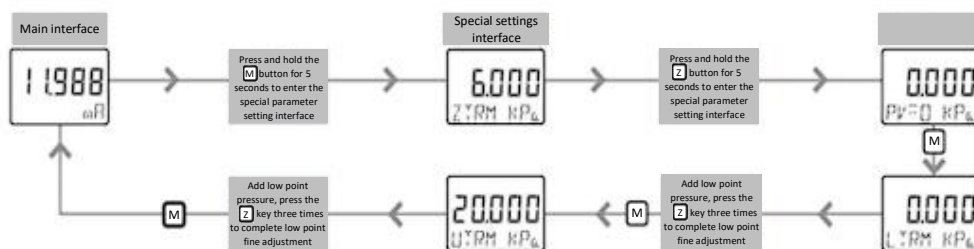
- Press the **Z** key to move the selection up and down, select "Damping Time", and short press M to enter;
- Press the S key to select the modified digit, and short press the Z key to modify the number, and set the number to "88.888";
- Press M to save, and then the transmitter parameters will be restored to the factory settings.

6.2 Panel diagram of the second type of display module (backlight is white)

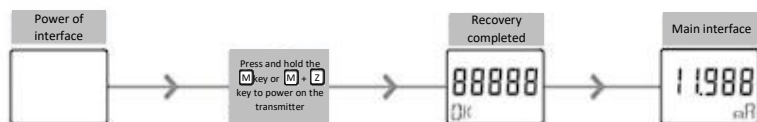
General parameter settings



PV clearing and high and low point fine-tuning settings



Factory reset



6.3 The Third Type of Display Module Panel Diagram (Backlight Is The Blueprint)

1. Overview of LCD display functions

Users can set the variables displayed on the LCD and the number of decimal places displayed through the configuration software. See "Instrument Configuration" and "Output Features" in the configuration software settings section.

LCD supports dual-variable display, and the display variables that can be set include current, the percentage of the main variable and the main variable; each variable can independently set the display decimal point position: 0, 1, 2, 3, 4.

If the two display variables are the same, the LCD will display only one variable; otherwise, the LCD will alternately display the set display variables at intervals of 3 seconds.

The full-brightness display of the LCD is shown in Figure 1-1:

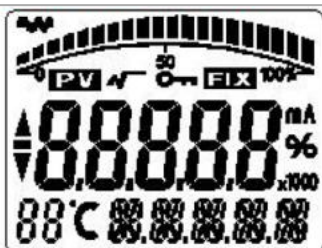


Figure 1-1 Full-brightness display of the LCD

The main variable percentage display is shown in Figure 1-3:

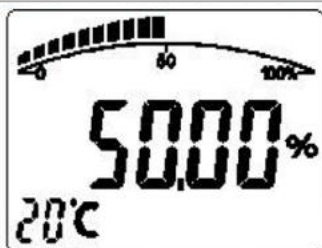


Figure 1-3 Main variable percentage display

The current display is shown in Figure 1-2:

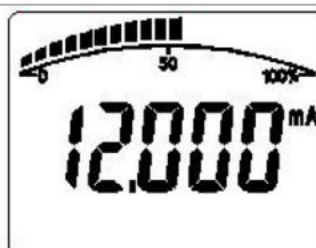


Figure 1-2 Current display

The main variable percentage display is shown in Figure 1-3:

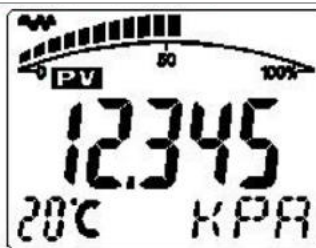


Figure 1-4 Main variable display

Other display instructions:

- If in communication mode, the upper left corner of the LCD will flash .
- If it is a square root output, the LCD will display .
- If write protection is enabled, the LCD will display **FIX**.
- If the temperature display is enabled, in the real-time normal display, the LCD will display the temperature in the lower left corner with the character "88". If the temperature is less than -19 °C or greater than 99 °C, it will display .

2. Key Function

The key can be used to **zero the main variable; zero migration 【zero】 , range migration 【full】 ; set the unit, range, damping, and set the display variable.**

2.1 Key Function Code Quick Lookup Table

When using key configuration on-site, the "88" character in the lower left corner of the LCD is used to indicate the current setting variable type, that is, the setting function performed by the current key. The corresponding relationship is:

The "88" character in the lower left corner displays	Set variable
0 or empty	Normal display
1	Enter the operation code (you can directly enter the number corresponding to the function below to directly set the corresponding function)
2	Set the unit
3	Set the lower limit of the range
4	Set the upper limit of measurement
5	Set damping
6	Zero adjustment of the main variable
7	Zero-point migration and range migration [zero adjustment and full adjustment]
8	Output characteristics 【set linear output or square root output】

Note: Note: By entering the operation code corresponding to each function, you can quickly enter the corresponding function. For example, enter "5" and directly enter the setting damping function.

2.2. Description of Key Mode

This product supports two operating modes: "double-button" and "three-button".

"Three buttons" operation mode: faster operation, suitable for products with 3 buttons on LCD. At this time, the 2 key is used to enter the prompt data setting interface and shift: the S key is used to enter the data setting interface, add numbers, and data storage; the M key is used for data saving.

2.3. Data Setting Method

When the "88" characters in the lower left corner show 1 to 7, it indicates that the transmitter is in field configuration mode. At this time, you can enter the password, modify parameters, or migrate by pressing the button.

During the data setting process, the "S" key is used to adjust numbers and decimal points, the "Z" key is used for shifting, and the "M" key is used to save.

The setup process is as follows:

1. Press the **S** key to enter the data setting interface, and the symbol bit begins to flash, indicating that the symbol bit can be modified.
2. If you press the **S** key again, you can switch the positive or negative of the data (the positive sign is represented by the upper arrow).
3. Press the **B** key, and the first number bit begins to flash, indicating that it can be modified. At this time, press and press the **S** key for a long time or repeatedly in a row, and set the number to loop between 0 and 9.
4. Press the **Z** key again to set the second to fifth digits in turn. The setting method is the same as the first one.
5. After setting the fifth digit, press the **B** key to start setting the decimal point. The four decimal points begin to flash at the same time, which means that the decimal point can be set. At this time, press the **S** key to switch the decimal point position.
6. After the decimal point is set, press the **Z** key, and the lower left arrow begins to flash, indicating that the settings can be saved.
7. Press the **S** key to save the settings; press the **Z** key, the symbol bit begins to flash, and you can start setting the data again.

Note: In the "three-button" operation mode, during the data setting process, you can press the M key at any time to quickly save the settings without waiting for the down arrow to flash to save the settings.

3. Key Operation Instructions

3.1. The Function of Zeroing the Main Variable

In the normal display state in real time, **press the "M" + "Z" key at the same time, and hold it for 5 seconds to directly enter the main variable zeroing function.**

After entering the "main variable zeroing" function, the function code in the lower left corner shows "6", the current main variable value is displayed in the middle, and the lower area shows "YES" or "NO".

- When "YES" is displayed, press the "M" key to perform the "main variable zero" operation. **After performing this function, press the M key continuously with the output pressure of "0", 0 appears in the lower left corner, and press the S key to return to the main interface.**
- When "NO" is displayed, press the "S" key, NO becomes YES, press the "W" key, and perform the "zero the main variable" operation. After performing this function, press the W key continuously with the output pressure of "0", 0 appears in the lower left corner, and press the S key to return to the main interface.

3.2. Configuration Function

3.3. Functional Overview

In the normal display state in real time, press the Z key to enter the configuration data setting state.

After entering this state, "01" is displayed in the lower left corner of LCD, prompting you to enter the operation code. Enter different operation codes and enter different function settings interfaces. After the corresponding function is set up, the circular conversation will be carried out automatically.

The "88" character in the lower left corner displays	Set variable
2	Set the unit
3	Set the lower limit of the range
5	Set damping
6	Zero adjustment of the main variable
8	Output characteristics 【set linear output or square root output】

According to the 2.2 data setting method, the operation code input, the upper and lower limits of the measuring range and the damping settings can be completed.

Description:

- If you set the mode for two keys, press the S key when the down arrow flashes to realize the M key saving function.
- If the data limit is exceeded, the LCD will display "OVER". At this time, press the S key or the Z key to reset it.
- After the configuration data is set up and returned to the normal display state, if the user presses the Z key again within 10 seconds, then restart the configuration setup process and skip the input code verification step.
- After entering the configuration data settings, if no button is pressed within 2 minutes, it will return to normal display.
- If you enter the operation code in "Function 1", perform the following functions:
Enter "XXXX2" (that is, the first 4 digits can be any number), and then enter the unit setting.
Enter "XXXX3" (that is, the first 4 digits can be any number), and then enter the lower limit setting of the range.
Enter "XXXX5" (that is, the first 4 digits can be any number), and then enter the damping setting.
Enter "XXXX6" (that is, the first 4 digits can be any number), and then enter the main variable to zero.
Enter "XXXX8" (that is, the first 4 digits can be arbitrary), and then enter the output characteristic adjustment.

If enter other data, it will return to normal display. This can avoid human error. Set the unit.

In the process of setting the unit, the lower right corner of the LCD flashes to display the currently selected unit. The unit setting process is as follows:

- 1) Press the "S" key and select the main variable unit in turn; (kPa, Torr, atm, MPa, inHO, inHG, ftHO, mmHO, mmG, psi, bar, mbar, gcm, kgcm, Pa etc.)
- 2) Press the "Z" key or the "M" key to confirm the currently selected unit of the main variable, and directly enter the "Lower Limit Settings" function interface.

Description:

- Display unit "l4H20" indicates: 4 degrees Celsius inch water column;
- Display unit "m4H20" indicates: 4 degrees Celsius millimeter water column;

3.3.1. Set the Range

When setting the range, you must first enter the "lower limit of the range", and then enter the "upper limit of the range".

In the process of setting the range, the operation code in the lower left corner shows "03" or "04", corresponding to the input "lower limit" and "upper limit" respectively. After the lower limit of the range is entered, it will automatically enter the setting of the upper limit of the range.

For the input method of data, please refer to "2.2 Data Setting Method".

3.3.2. Set the Damping

You can directly enter the setting damping page by entering the operation code "5", or directly enter the setting after setting the upper limit of the range.

When the operation code in the lower left corner shows "05", it means that the damping value is set. The input range of the damping value is 0~32 seconds.

For the input method of data, please refer to "2.2 Data Setting Method".

Special note: If the input damping value is "05678", the "restore factory settings" operation will be automatically performed. 【 You need to perform the "data backup" operation before leaving the factory.】

3.3.3. Set Output Characteristics

In the output characteristics, the lower right corner of the LCD flashes to display the currently selected output characteristics (linear LIN output, or square SQRT output). The setup process is as follows:

- 1) Press the "S" key and select the current output mode in turn; (LIN, SQRT)
- 2) Press the "Z" key or "M" key to confirm the currently selected output feature, and end this round of settings, and return to the "End Settings" function interface [LCD lower left display function code "0"]. If there is no key operation within 10 seconds, it will return to the normal display, otherwise, it will continue to be set from the range unit [no need to enter the operation code again].

Note: LIN represents linear current output; SQRT represents open current output.

3.3 Zero-point migration and range migration [zero and full]

In the normal display state in real time, press the "Z" key and the "S" key at the same time, and hold it for 5 seconds to enter the zero-point migration and range migration state. At this time, the operation code in the lower left corner shows "07", indicating that it can be zeroed and full "Zero migration", that is, "zero" operation: the current pressure is set to the lower limit of the range, and the transmitter output is adjusted to 4mA.

"Range migration", that is, "full" operation: the current pressure is set to the upper limit of the range, and the transmitter output is adjusted to 20mA.

During the setup process, if the key is not pressed within 2 minutes, it will return to the normal display state.

3.4 Display Variable Settings

The LCD display can display one of the three variables of "current", "percentage" and "main variable" or two of them alternately (with an interval of 4 seconds). In the real-time normal display state, the S key can be used to change two display variables. When the two display variables are set to the same parameters, one variable is fixedly displayed on the screen; when the two display variables are set to different parameters, two variables are displayed alternately on the screen.

The method is as follows: Press the "S" key, the current display variable (e.g. current) changes, and the "current, percentage, main variable" is displayed in a loop. When the required display variable (such as the main variable) appears on the screen, release the "S" key, which realizes the change of the display variable "current" to "main variable".

Example: Assuming that the current display variable is "current", it needs to be set to: alternately display "master variable" and "percentage".

Steps: Modify the first display variable: Press the "S" key, and the liquid crystal cycle displays "current, percentage, main variable". When the "main variable" is displayed, release the "S" key. Currently, the LCD alternately displays the "main variable" and "current".

Modify the second display variable: When the liquid crystal displays "current", press the "S" key, and the liquid crystal cycle displays "current, percentage, main variable". When the "percentage" is displayed, release the "S" key, that is, the setting is successful.

Note: This function is only supported by boards with software version number 2.5 or above; and the number of decimal places of "current" and "main variable" will be automatically switched to three digits after adjustment with the key, and "percentage" will be automatically switched to one digit.

3.5 Restore Factory Settings

If the transmitter has backed up the configuration and other data before leaving the factory, you can restore the data on site by pressing the damping "5678". By pressing the key, when entering the damping in item 5, enter "05678" and save, the backup data will be restored. 【This operation does not affect the actual damping value】

Quick Check of Button Functions

Change The LCD Display and Decimal Points

When it is displayed normally, press and hold the S key for a long time to switch the display. At the same time, DPO, DP1, DP2 and DP3 are displayed to indicate the number of decimal places displayed. When it needs to be displayed, you can let go. At this time, it may display the jump every 3 seconds. When no variable appears, just repeat the above operation once.

Menu 2: Change of Unit

During normal display, long press the B key, release when the cursor moves to the rightmost position, press the S key, change the number to "00002", press the M key once, and the liquid product prompts "main variable unit".

Menu 3/4: Change of Range

When the display is normal, long press the Z key, release it when the cursor moves to the rightmost position, press the S key, change the number to "00003", press the M key once, and the LCD prompts "lower limit of range".

Press the S key once, the cursor moves to "+", press the Z key to shift, and press the S key to change the number. **After the number "9" is displayed, press the S key again, and a decimal point will appear.** After entering, press the M key to save the data and move the cursor up. (Note: If you do not need to adjust the lower limit, you can directly press the M key to skip after entering the "lower limit of range" and directly enter the "upper limit of range") Press the M key once to enter the next menu.

At this time, the liquid product prompts "upper limit of range", repeat the above operation, change the number and press the M key to save.

Menu 5: Change of Damping

When the display is normal, press and hold the Z key, release it when the cursor moves to the rightmost position, press the S key, change the number to "00005", press the M key once, and the LCD prompts "Damping (S)".

Press the S key once, the cursor moves to "+", press the Z key to shift, and press the S key to change the number. After the number "9" is displayed, press the S key again, and a decimal point appears. After entering, press the M key to save the data and move the cursor to the upper left corner. Press the M key once to enter the next menu.

Menu 6: Zeroing of Primary Variable

When displaying normally, long press the Z key, release the cursor when it moves to the rightmost position, press the S key, change the number to "00006", press the M key once, and the liquid product prompts "Zeroing of primary variable".

Press the S key to switch between "No" and "Yes". When "Yes" is displayed, press the M key to complete zeroing, save and move the cursor up.

Shortcut key: When displaying normally, press the M+Z keys at the same time and hold for 5 seconds. The number "Zeroing of primary variable" is shown in the upper left corner of the LCD, and other operations are the same as above.

Menu 8: Output Function

When displaying normally, long press the Z key, release the cursor when it moves to the rightmost position, press the S key, change the number to "00008", press the M key once, and the liquid product prompts "Output characteristics".

Press the S key to switch between "Linear" and "Square root" when the required function appears, press the M key to save.

Menu 9/10: Calibrate Upper and Lower Limits

When the display is normal, long press the Z key, release it when the cursor moves to the rightmost position, press the S key, change the number to "00009", press the M key once, and the liquid product prompts "lower limit calibration".

Press the S key once, the cursor moves to "+", enters calibration, **add the corresponding pressure**, press the Z key to shift, press the S key to change the number, after the number "9" is displayed, press the S key again, and a decimal point appears. After entering, press the M key to save the data and move the cursor up, press the M key once to enter the next menu.

At this time, the liquid product prompts "upper limit calibration", **add the corresponding pressure**, repeat the above operation, enter the pressure value and press the W key to save.

Note: This function requires that both menus 9 and 10 must be calibrated at the same time! And the upper and lower limits cannot be the same pressure!

Menu 11: Migration of Any Point

After adjusting the "upper limit calibration", press the M key once to enter the "migration of any point", refer to the data setting method of item 9/10, set the value to be migrated to on the screen (current pressure value), press the M key, and save the data.

Note 1: In any menu of 2-3-4-5-6-8, each time you press the M key, you will switch to the next menu, and any changes will be saved at the same time. After setting menu 8, return to the main interface display (at this time, there is no percentage progress bar display, and the value display is correct). At this time, if there is no key operation, it will automatically exit after 10 seconds and start normal display. If there is a key operation within 10 seconds, the 2-3-4-5-6-8 menus will be re-circulated.

Note 2: Enter **5678.0** in the damping to **restore the instrument to the factory state**, provided that a backup was made before leaving the factory.

Note 3: Menu 9-10-11 requires professional operation, so it is not in the above cycle and can only be entered through "00009".

Menu 20: User-Defined Units

During normal display, long press the Z key, release the cursor when it moves to the 4th digit, press the S key, change the number to "00020", press the M key once, the LCD prompts "User unit coefficient", and the second line displays the current setting value.

Press the S key once, the cursor moves to "+", press the Z key to shift, and press the S key to change the number. After the number "9" is displayed, press the S key again, and a decimal point appears. After entering, press the M key to save the data and move the cursor up, and press the Z key to exit.

Note: This coefficient is the conversion coefficient between "user-defined units" and kPa, and its function is the same as the software "user coefficient".

Menu 21: Liquid level density

During normal display, long press the Z key, release the cursor when it moves to the 4th digit, press the S key, change the number to "00020", then press the Z key once, the 5th digit starts to flash, press the S key once, change the number to "00021", press the M key, the first line of the LCD prompts "density", and the second line displays the current setting value.

Press the S key once, the cursor moves to "+", press the Z key to shift, and press the S key to change the number. After the number "9" is displayed, press the S key again, and a decimal point will appear. After entering, press the M key to save the data and move the cursor up, and press the Z key to exit.

Note: The density unit is fixed to g/cm³. This density is only valid when the main variable unit is m, cm, mm, feet, inch, and other liquid level units.

Menu 50: Primary Variable Cut-Off Mode

When displaying normally, long press the Z key, release the cursor when it moves to the 4th digit, press the S key, change the number to "00050", press the M key once, the LCD prompts "Primary variable cut-off mode", and the second line displays the current set cut-off mode.

Press the S key, the third line displays to switch between "Cancel", "Zero", "4mA_20mA" and "Zero_4mA_20mA", press M key to save and move the cursor up.

Menu 51: Primary Variable Cut-Off Value

After adjusting "50", press the M key to enter. The first line of the LCD prompts "Primary variable cut-off value (%)" and the second line displays the current setting value.

Press the S key once, the cursor moves to "+", press the Z key to shift, and press the S key to change the number. After the number "9" is displayed, press the S key again, and a decimal point appears. After entering, press the M key to save the data and move the cursor up, and press the Z key to exit.

Menu: 100 Set Contrast

When displaying normally, press and hold the Z key, release it when the cursor moves to the third digit, press the S key, change the number to "00100", press the M key once, the first line of the LCD prompts "Contrast", and the second line displays the current contrast.

Press the S key, the number switches between 1-5, switch to the appropriate number, press the I key, save the data and move the cursor up, press the Z key to exit.

Part 2 Installation and Commissioning Instructions for Online Density Meter

1. Precautions for installing online density meter

1. Installation Instructions for Differential Pressure Densitometer

Due to the needs of the process flow, online density meters are often installed in sites with relatively harsh working conditions. In order to minimize the severity of the working conditions of the density meter, it should be installed in places with small temperature gradients and temperature changes, no impact and vibration, and no bubbles. Only by fully considering the unique conditions of the site can it play its due accuracy indicators. Pay attention to the following matters during installation:

1. The product must be installed vertically, with a verticality of no more than 5 degrees to the ground (if it is not installed vertically, or the local gravity acceleration deviates from the standard gravity).
2. When installing from the side, ensure that the straight pipe section of the flange can be installed smoothly.
3. After opening the cover of the electrical box, tighten it when reinstalling to ensure close contact with the sealing O-ring. If it is not tightened, moisture will enter the electrical box and affect the normal operation of the circuit.
4. The housing of the density meter must be effectively grounded.
5. Install the device as far away from the inverter or high-power motor as possible. Take isolation measures when necessary and use shielded power cables.
6. After installation, adjust the zero value when the tube is empty so that the density value is displayed as 0g/cm^3 . **(Note: Zero adjustment is required. See the next page for detailed steps.)**
7. The distance between the sensor parts of the direct online liquid density meter is at least 200mm and the diameter is 50mm. The installation site cannot be smaller than these dimensions.
8. The on-site liquid must be kept submerged in both measuring sensors. The distance from the flange to the first sensor is optional.
9. When installing the pipeline, the liquid should enter the liquid from below the lowest sensor, or from above the highest sensor, not from the middle. When installing the pipeline to pass liquid, leave at least 30CM liquid buffer distance for the pipeline valve or elbow.
10. The red flange matching part of the installation diagram is provided for the user to install. If matching flanges are required, please indicate when ordering.
11. Connect the signal "+" to the "-" pole of the density meter, and short-circuit the 24V "-" and current signal terminals "" on the secondary meter.
12. If there is corrosive liquid outside the site environment, please take protective measures; if there is a risk of lightning strike, please install grounding devices around.
13. If disassembly for cleaning is required, please ensure that the sensor diaphragm is not subject to collision or other damage during disassembly and assembly.

2. Tuning fork density meter installation instructions

Due to the needs of the process, tuning fork density meters are often installed in sites with harsh working conditions. In order to minimize the harshness of the working conditions of the density sensor, pay attention to the following matters:

★☆The tuning fork density meter should be installed in a place with small temperature gradient and temperature change, and without impact and vibration. The measured medium is not allowed to freeze, otherwise it will damage the sensor element and cause damage to the tuning fork density meter.

☆Prevent contact with corrosive or overheated measured media.

☆Prevent slag from accumulating inside the tank.

☆Handle with care to avoid damaging the tuning fork density meter.

☆It is forbidden to operate the instrument above the rated pressure.

☆It is forbidden to drop the instrument directly.

☆It is forbidden to measure highly corrosive liquids.

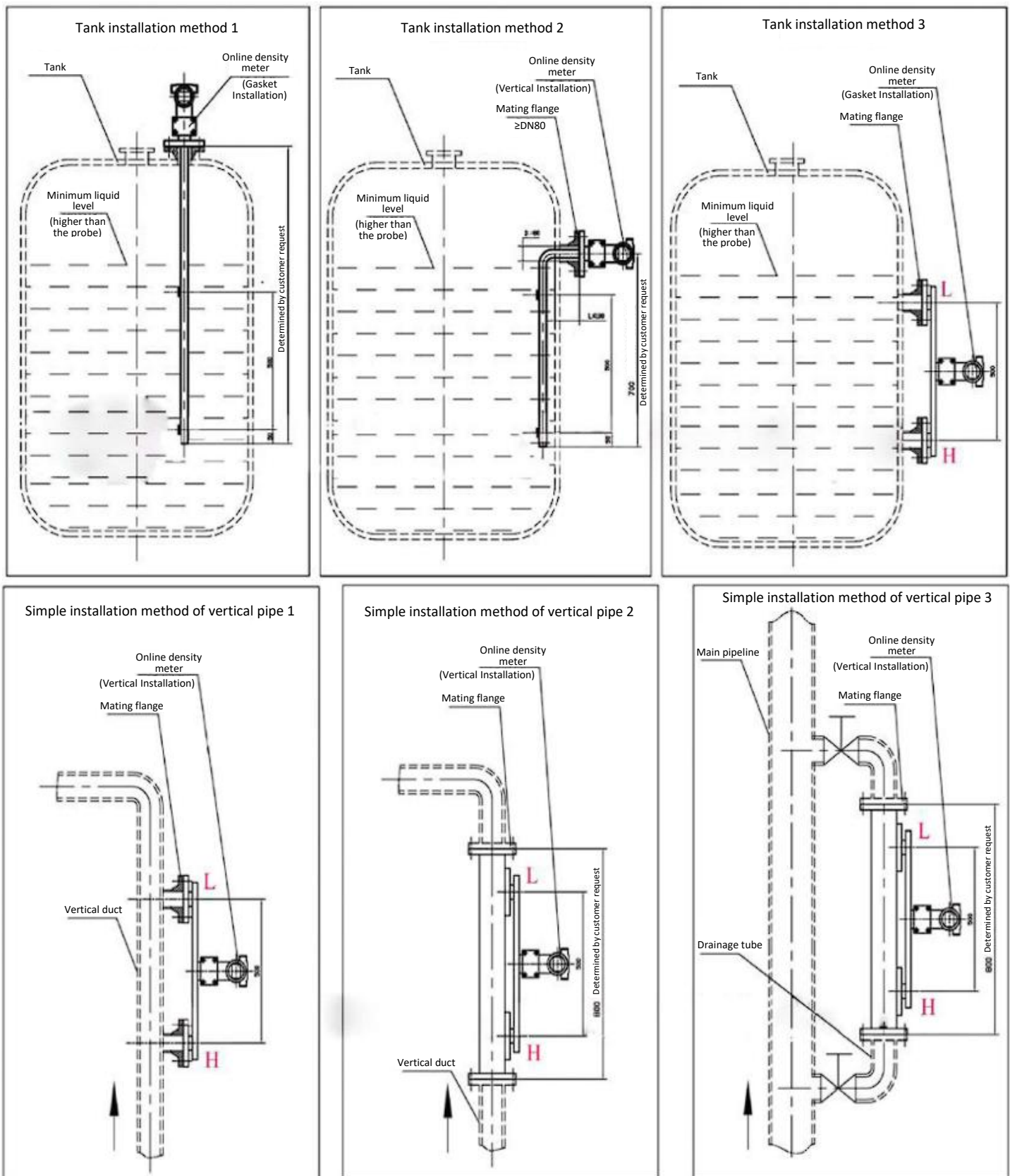
☆It is forbidden to perform pressure test exceeding the specified test pressure.

☆Note: The instrument is suitable for all explosion-proof occasions.

☆ Note: It is forbidden to weld the pipe when installing the tuning fork density meter.

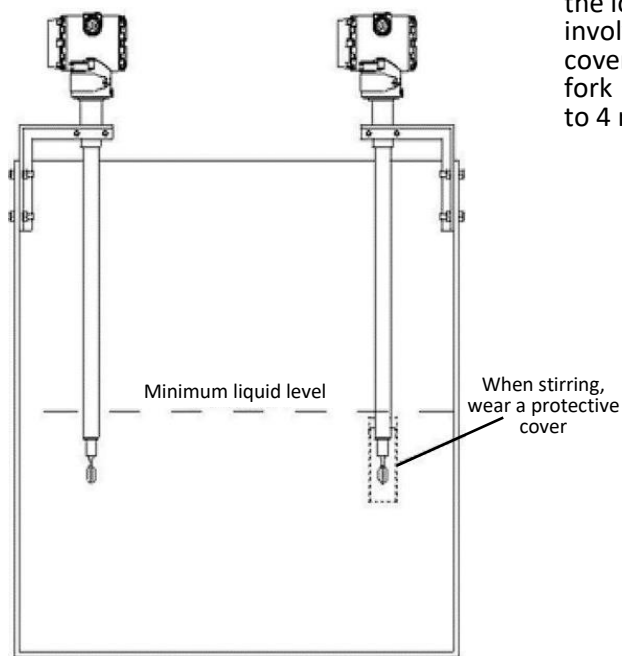
2. Online Density Meter Installation Guide

2.1 Differential pressure density meter installation diagram

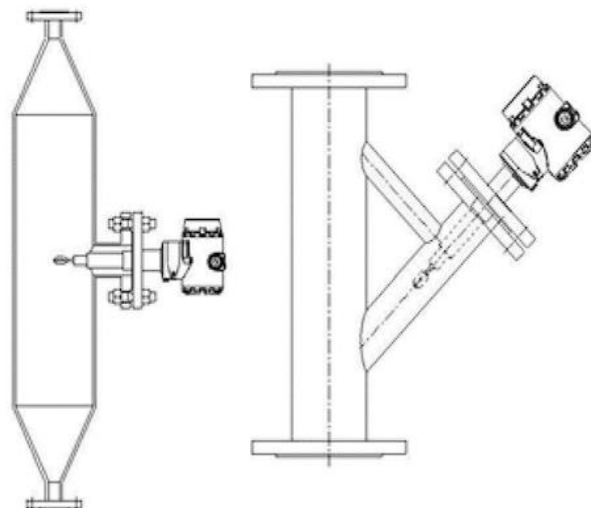


2.2 Tuning Fork Density Meter Installation Guide

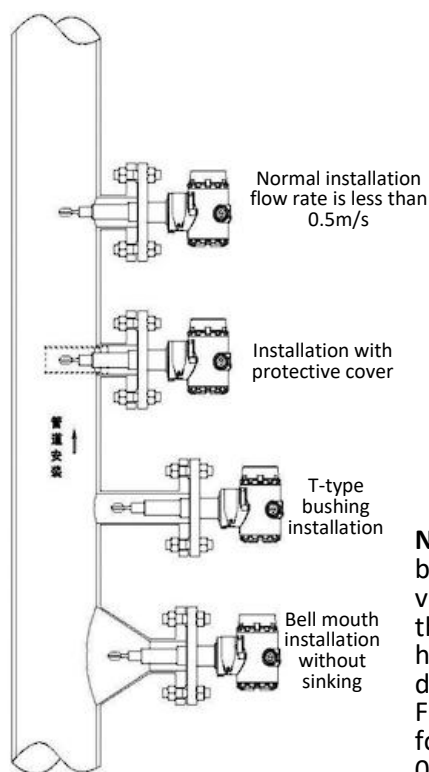
Open Tank Installation



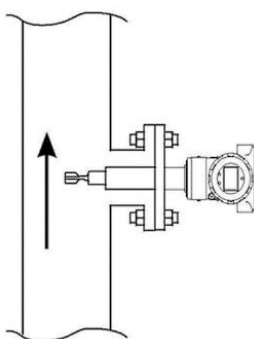
Note: When installing in an open pool or open tank, use a bracket to fix it. The tuning fork body must be below the lowest liquid level to be measured. When stirring is involved in the open pool or open tank, a protective cover is required. In this installation method, the tuning fork insertion rod is longer and can be up to 4 meters long.



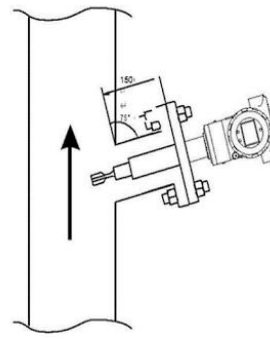
Pipe installation



Note: When the main pipeline diameter is small, a reducer can be used for installation, as shown in the left figure. When the pipeline flow rate is high, there are sediments and bubbles, the installation shown in the right figure can be used. The right part can be provided as an accessory, and its typical application is the field of desulfurization lime slurry density measurement.



When installing vertically, install the density meter on the pipe with vertical upward flow direction. When the flow rate is $\leq$ about 0.5m/s, install it according to the above figure.



When installing vertically, install the density meter on the pipe with vertical upward flow direction. When the flow rate is 0.5-3m/s or the medium is viscous, install it according to the above figure.

Note: The fork body of the tuning fork density meter is not fully enclosed. The boundary effect of the pipe wall or container wall on the fluid plus the viscosity effect of the measuring medium itself will have a certain impact on the measurement calibration of the sensor. In order to overcome these, we have summarized and set the installation method and pipe diameter for different environments to facilitate the selection under the same conditions. For pipeline installation, when the flow rate is within 0.5m/s, the tuning fork can be directly extended into the pipeline; when the flow rate exceeds 0.5m/s and there is no precipitation, it can be installed with a protective cover or T-type sleeve, and the tuning fork fork is inside the protective cover or T-type sleeve; when precipitation occurs, it is installed with a bell mouth. At any time, the opening direction of the fork body should be in a vertical direction to avoid sediment or bubbles accumulating on the fork body.

Pipeline installation instructions - To ensure that the density meter can measure accurately and display stably, the flow rate of the measured medium shall not be greater than 1m/s. The location of the installation of the density meter should be as far away from the pump as possible, and the distance should preferably be greater than 5m; When the flow rate is greater than 1m/s, the expansion installation is adopted. For every increase of 1m in the flow rate, the diameter of the pipeline where the density meter is installed is expanded by 1.5 times. There must be a straight pipe section of $\geq 600\text{mm}$ in front of the meter and a straight pipe section of $\geq 300\text{mm}$ behind the meter to ensure that the fluid is in a laminar state when flowing through the fork body.

Installation standard	DC flow	T-type opening (pipe diameter)	Fluid feedthrough container
Illustrate	The fork body directly enters the main fluid	The fork body is retracted into the side opening of the pipeline to avoid the main fluid and retract into the 25.4 mm opening	The fork body is installed in the DC container, which is the mainstream to form a reflux
Flow rate	The flow rate through the fork is 0.3 – 0.5m/s	The flow rate of the main pipeline is 0.3 – 0.5m/s	10 – 30L/min
Viscosity range	Max. 2000cP	Max. 500 cP	Max. 2000cP
Medium temperature	-10 ~ 120°C	-10 ~ 120°C	-10 ~ 120°C
Main pipe size	$\geq$ Horizontal pipe 100mm (4") $\geq$ Vertical pipe 150mm (6")	$\geq 50\text{mm}$ (2")	Unlimited

3. Online Density Meter Debugging Instructions

The tuning fork density meter has been debugged and calibrated before leaving the factory. It does not need to be debugged under normal circumstances and can be used directly. The standard differential pressure density meter needs to be zeroed after installation. The specific zeroing steps are as follows:

In the real-time normal display state, press the "M" + "Z" keys at the same time and hold for 5 seconds to directly enter the main variable zeroing function. At this time, the lower left corner of the panel displays 6 and the lower right corner displays NO. Press the S key twice to switch NO to YES. Press the M key twice to display 0 in the lower left corner. Zeroing is successful.

Wait until it automatically returns to the main interface. Non-standard hose-type differential pressure density meter needs to be calibrated on site. The specific steps are as follows:

1. Zero adjustment after installation is completed. Refer to the above zero adjustment steps!

2. Calibrate the lower limit. In the normal display interface, press and hold Z until the rightmost 0 flashes, then press S to change to 9. Press once, and the lower left corner Display 9, press S (be careful not to press too much), the upward arrow on the left flashes, press Z to shift, S to change the number, all numbers change to 0, press M until 0 is displayed in the lower right corner, and the air display is 0.000.

3. After completing step 2, pour in clean water with a known density of 1.000g/cm^3 , so that the upper and lower diaphragms of the density meter are completely immersed in the water.

4. Calibrate the upper limit. In the normal display interface, press and hold Z until the rightmost 0 flashes, press S to change to 9, press M twice, and the lower left corner displays 10. Press S once (be careful not to press too many times), the upward arrow on the left flashes, press Z to shift, S to change the number, the number changes to 1.000, Press M until 0 is displayed in the lower right corner to complete the upper limit calibration. At this time, the measured water density is 1.000. Note: If you press the wrong key, please turn off the power and try again. If you press the wrong key and continue to operate, all data may be erased and the device can only be returned to the factory for repair.

4. Common troubleshooting of online density meter

In the event of a malfunction, the following steps may help identify the cause of the problem and determine whether disassembly and repair are necessary.

1. No display

Check whether the power supply is connected properly; check whether the circuit is short-circuited; whether the positive and negative poles of the power supply are connected in reverse. 6.2 If the deviation becomes larger, check whether there is gas trapped on the diaphragm side. If there is gas, loosen the drain valve to release the gas. Check whether there is sediment crystallization on the diaphragm side: If there is sediment or crystallization, flush it through the flushing hole. If it cannot be flushed, remove the flushing ring and clean it. Be careful not to damage the diaphragm during cleaning. Check whether the voltage is normal; if the change is seasonal, make seasonal adjustments.

2. Unstable output

Check whether the temperature has entered the working steady state: Check whether there are inverters or high-power engines around the machine, and take necessary isolation measures: Fluid Check whether the speed fluctuates too much. Wait until the fluid is stable before measuring. Check whether the pipeline is full of fluid and whether there is gas. Check whether the pipeline has strong vibration. Check whether the power supply voltage fluctuates too much. Check whether the damping value is set too small. Proper adjustment of damping can increase stability (use the handheld operator to adjust the damping parameters).